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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/618,693	07/15/2003	Hiroyuki Kiso	240302US0	7054

22850 7590 12/01/2008  
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EXAMINER
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COONEY, JOHN M

ART UNIT	PAPER NUMBER
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1796

NOTIFICATION DATE	DELIVERY MODE
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12/01/2008

ELECTRONIC

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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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*Ex parte* HIROYUKI KISO,  
KATSUMI TOKUMOTO, and YUTAKA TAMANO

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Appeal 2008-1990  
Application 10/618,693  
Technology Center 1700

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Decided: November 26, 2008

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Before CHUNG K. PAK, CHARLES F. WARREN, and  
LINDA M. GAUDETTE, *Administrative Patent Judges*.

WARREN, *Administrative Patent Judge*.

DECISION ON APPEAL

Applicants appeal to the Board from the decision of the Primary Examiner finally rejecting claims 1, 4, and 29 through 38 in the Office Action mailed July 11, 2006, of which claims 34 through 36 were cancelled in the Amendment filed February 8, 2007 that was entered by the Primary Examiner in the Office Communication of May 29, 2007. 35 U.S.C.

§§ 6 and 134(a) (2002); 37 C.F.R. § 41.31(a) (2006).

We affirm the decision of the Primary Examiner.

Claim 1 illustrates Appellants' invention of a catalyst for producing a rigid polyurethane foam, and is representative of the claims on appeal:

1. A catalyst for producing a rigid polyurethane foam by means of at least one blowing agent selected from the group consisting of 1,1,1,3,3-pentafluoropropane (HFC-245fa), 1,1,1,3,3-pentafluorobutane (HFC-365mfc) and a low boiling point hydrocarbon, which comprises:

at least one amine compound (1) selected from the group consisting of dimethylethylamine, dimethylpropylamine, dimethylbutylamine, dimethylpentylamine, dimethylhexylamine, dimethylheptylamine, dimethyloctylamine, dimethylnonylamine, dimethyldecylamine, dimethylundecylamine, dimethyldodecylamine, dimethyltridecylamine, dimethyltetradecylamine, dimethylpentadecylamine and dimethylhexadecylamine,

and at least one amine compound (2) selected from the group consisting of triethylenediamine, N,N,N',N'-tetramethyl-1,6-hexanediamine and N,N-dimethylcyclohexylamine,

wherein said at least one amine compound (1) and said at least one amine compound (2) are present in amounts effective to improve at least one property of a rigid polyurethane foam produced by means of said at least one blowing agent and said catalyst, compared to an otherwise identical rigid polyurethane foam produced using said at least one amine compound (1) alone, or said at least one amine compound (2) alone, as the catalyst, and wherein said at least one property includes dimensional stability.

The Examiner relies upon the evidence in these references (Ans. 2-3):

Lancaster	4,585,804	Apr. 29, 1986
Naka	4,742,089	May 3, 1988
Canaday	4,760,099	Jul. 26, 1988

Appellants request review of the following grounds of rejection advanced on appeal (App. Br. 2-3):

claims 1, 29 through 33, and 38 under 35 U.S.C. § 103(a) as unpatentable over Lancaster, alone, or in view of Naka (Ans. 4);

claims 1, 29 through 33, 37, and 38 under 35 U.S.C. § 103(a) as unpatentable over Canaday, alone, or in view of Naka (Ans. 6); and

claims 1, 29 through 33, 37, and 38 under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement (Ans. 3).

Appellants argue the claims in the first ground of rejection as a group, and further argue claims 29 through 31 and 38. App. Br. 15-18. Appellants argue the claims in the second ground of rejection as a group based on the arguments presented with respect to the first ground of rejection, and further argue claims 29 through 31, 37, and 38. App. Br. 19-21. Appellants argue the claims in the third ground of rejection as a group. Thus, we decide this appeal based on claim 1 and on claims 29 through 31, 37, and 38 to the extent argued in the Briefs. 37 C.F.R. § 41.37(c)(1)(vii) (2005).

The threshold issue in this appeal with respect to the grounds of rejection under § 103(a) is whether Appellants have shown that the teachings of Lancaster, alone or in view of Naka, and of Canaday, alone, or in view of Naka would not have disclosed to one of ordinary skill in this art a catalyst mixture as claimed, and if not, the issue with respect to the grounds of rejection under § 103(a) is whether Appellants have shown that comparative evidence in the Specification rebuts the prima facie case of obviousness in each instance. The issue in this appeal with respect to the grounds of rejection under § 112, first paragraph, written description requirement, is whether Appellants have shown that the Specification, at the time it was filed, disclosed the claimed invention to one skilled in the art.

The plain language of independent claim 1 specifies a catalyst comprising at least a mixture of at least one tertiary alkyl amine from group

(1) (amines (1)) and at least one amine with tertiary alkyl amino group(s) from group (2) (amines (2)).<sup>1</sup> Appellants specify “the rigid polyurethane foam includes an isocyanate ring-containing polyurethane foam (hereinafter referred to as a rigid polyisocyanurate foam).” Spec. 1:6-9.

There is no dispute the preambular language setting forth use of the claimed catalyst mixture to produce any rigid polyurethane foam “by means of” any amount of at least one blowing agent from the group of two pentafluoroalkanes and any low boiling point hydrocarbon is a statement of intended use and not a limitation. Ans. 8-9; Reply Br. 2. However, claim 1 specifies in the last clause that the amounts of the amines (1) and (2) present in the catalyst mixture must be effective to improve to any extent, however small, at least the property of dimensional stability of *any one* rigid polyurethane foam produced “by means of” any amount, however small, of any of the blowing agents specified in the preambular language, when compared with the same property of *one* rigid polyurethane foam produced by a process that differs *solely* in that this foam is produced in the presence of a catalyst mixture containing any amount, however small, of amine (1) alone *or* any amount, however small, of amine (2) alone.

We determine there is no other limitation on the process of producing the rigid foam in the last clause of claim 1. Indeed, the transitional term “comprises” opens the claimed catalyst mixture to include mixtures containing any amount of any additional materials, including other catalysts

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<sup>1</sup> The compound triethylenediamine of group (2) is also known as 1,4-diazabicyclo[2,2,2]-octane, a “[c]atalyst in making urethane foams.” Monograph **9801. Triethylenediamine**, *The Merck Index* 9799 (Twelfth Ed., Whitehouse Station, NJ, Merck & Co., Inc., 1996),

such as those encompassed by dependent claim 33, that is, organic metal catalysts, metal carboxylate catalysts, tertiary amine catalysts other than amines (1) and (2), and quaternary ammonium salts. *See also* Spec., e.g., 33-35. *In re Baxter*, 656 F.2d 679, 686 (CCPA 1981) (“As long as one of the monomers in the reaction is propylene, any other monomer may be present, because the term ‘comprises’ permits the *inclusion* of other steps, elements, or materials.”). The claim language “by means of” merely means in context that some amount, however small, of a specified blowing agent must be present. Other blowing agents, also known in the prior art as “foaming agents,” including water, can be present in any amount as apparent from the disclosure in the Specification. Spec., e.g., Examples 1-24 and Table 1; *see also* Lancaster, e.g., col. 6, l. 23; Naka, e.g., col. 4, l. 24. Thus, in addition to the specified catalyst mixtures and blowing agents, the rigid foams can be prepared from any manner and amount of polyol and isocyanate starting materials in the presence of any manner and amount of other ingredients, such as additional catalysts and foam stabilizers. Spec., e.g., 35-42.

In our opinion, the last clause of independent claim 1 is so broad there is essentially no limitation on the amounts of amines (1) and (2) which can be present in the claimed catalytic amine mixtures, other than some amount of each must be present. Indeed, there is no limitation in claim 1 specifying that the claimed slight improvement in the property of dimensional stability must specifically be due to the amine (1) and amine (2) alone. All that is required is the catalyst mixture must contain any amount of amines (1) and (2) where the amount is effective in the context of the catalyst mixture as a

whole, that is, in concert with containing any additional ingredients in the mixture, to result in producing any rigid polyurethane foam that has any improvement in the property of dimensional stability over the rigid polyurethane foam produced using a catalyst mixture containing any amount of either amine (1) alone or amine (2) alone and the same additional ingredients, the process of preparing the compared rigid polyurethane foams otherwise the same.

In this respect, we thus find antecedent basis in claim 1 for the ranges of amines (1) and (2) in dependent claim 4; that is, the claimed catalyst “comprises” at least “from 10 to 95 wt% of the at least one amine compound (1) and from 90 to 5 wt% of at least one amine compound (2).” The difference in these claims is that unlike the claimed catalyst mixtures of claim 1, which can contain even smaller amounts of amines (1) and/or (2), the catalyst mixtures of claim 4 must contain at least 10 wt% amine (1) and 5 wt% of amine (2) and thus, can contain 85 wt% of any other compound capable of participating in the process of catalytically producing a rigid polyurethane foam.

Claims 29 through 31, dependent on claim 1, specify triethylenediamine, N,N,N',N'-tetramethyl-1,6-hexanediamine, and N,N-dimethylcyclohexylamine, respectively.

We interpret independent claim 37 in the same manner as claim 1 because this claim differs from claim 1 solely in that the claimed catalyst mixture has a delimited group of amines (1). Independent claim 38 differs from claim 1 in specifying the claimed catalyst mixture results in an improvement of “a balance of properties” which is “a combination of

flowability, adhesive strength and dimensional stability.” In our opinion, the term “balance” in context requires at least a net improvement, however small, in these three properties.

We find Lancaster would have disclosed to one of ordinary skill in this art a process of producing rigid polyurethane foam utilizing a primary aliphatic amine which, among other things, improves dimensional stability when compared to a process that does not use this ingredient, the processes otherwise utilizing the same components: a specified polyol, any polyisocyanate, any foaming agent, and at least one catalyst for reacting the polyol and primary amine with the polyisocyanate. Lancaster, e.g., abstract, col. 1, l. 34 to col. 2, l. 25, col. 4, ll. 44-45, col. 7, ll. 1-18 and col. 9, ll. 1-16, and Examples 1-26. The catalyst can include “tertiary amines” and “organometallic compounds,” such as, among others, triethylenediamine and dimethylethylamine, which can be used in mixtures. Lancaster col. 3, l. 59 to col. 4, l. 3. Lancaster discloses the polyurethane foams can contain isocyanurate groups by employing isocyanurate-forming catalysts such as tertiary amines including, among other things, triethylenediamine. Lancaster, e.g., col. 4, ll. 15-34. Lancaster illustrates the mixtures of catalysts with embodiments which utilize a mixture of Catalyst A, which is a 20/80 mixture of triethylenediamine and N,N-dimethylethanolamine, and Catalyst B, which is a commercially available tin mercaptide catalyst. Lancaster col. 6, ll. 16-20, and Examples 1-26. The foaming agents include low boiling hydrocarbons and halogen substituted hydrocarbons, wherein the latter can be, among other things, chlorocarbon and fluorochlorocarbon compounds, including 1,1,2-trichlorotrifluoroethane. Lancaster, col. 4,



ll. 4-10. Lancaster illustrates the foaming agents with embodiments that utilize either Foaming Agent A, which is the chlorofluorocarbon compound trichloromonofluoromethane alone, or along with Foaming Agent B, which is water. Lancaster col. 6, ll. 20-24, and Examples 1-26.

We find Canaday would have disclosed to one of ordinary skill in this art storage stable polyol compositions in reactions utilizing isocyanates to produce rigid polyurethane and polyisocyanurate foams which have the advantageous property, among other things, of dimensional stability. Canaday, e.g., abstract, col. 1, ll. 47-64, col. 12, l. 39 to col. 13, l. 62, and Examples 1-7. The polyol compositions include a polyol, at least one halogenated organic blowing agent, at least one amine catalyst, and at least one organometallic compound which prevents premature deactivation of the amine catalyst in the polyol premix composition. Canaday, e.g., abstract, col. 2, ll. 13-60, and Examples 1-7. The blowing agents include, among other things, chlorofluorocarbons which can be, among other things, trichloromonofluoromethane and monochloro-pentafluoroethane. Canaday, e.g., col. 10, l. 62 to col. 11, l. 22. The amine catalyst can be tertiary amines known in the art to synthesize polyurethane, including, among other things, dimethylbutylamine, triethylenediamine, tetramethylhexylmethylenediamine, that is, N,N,N',N'-tetramethyl-1,6-hexanediamine, and dimethylcyclohexyl amine, that is, N,N-dimethylcyclohexylamine, which can be used in mixtures. Canaday, e.g., col. 11, l. 23, to col. 12, l. 11. The polyol compositions can include foam stabilizers which can be surfactants including, among other things, silicone type surfactants. Canaday, e.g., col.

12, ll. 12-28. The polyol compositions can further include other additives used to produce polyurethane foams. Canaday, e.g., col. 12, ll. 29-35.

We find Naka would have disclosed to one of ordinary skill in this art a process of producing rigid polyurethane foam which exhibits dimensional stability by using a mixture of polyols, any polyisocyanate, any blowing agent, a foam stabilizer, a reaction catalyst, and other components. Naka, e.g., col. 2, ll. 11-40, col. 4, ll. 19-23, col. 5, l. 38 to col. 6, l. 6, and Examples 1-13. The blowing agent can be, among other things, water and a fluorocarbon compound, wherein the fluorocarbon compound can be, among other things, trichlorotrifluoroethane and “dichlorotetrachloroethane (sic, dichlorotetrafluoroethane).” Naka, e.g., col. 4, ll. 24-34. The reaction catalyst can be, among other things, tertiary amines and mixtures of tertiary amines and organometallic salts, wherein the tertiary amines can be, among other things, trimethylamine, triethylenediamine, tetramethylhexylmethylene diamine, that is, N,N,N',N'-tetramethyl-1,6-hexanediamine, and dimethylcyclohexyl amine, that is, N,N-dimethylcyclohexylamine. Naka, e.g., col. 4, ll. 35-64. Naka illustrates the reaction catalysts with a mixture containing triethylenediamine, trimethylaminoethylpiperazine, and dimethylamineoxadecane, that is, dimethyloctadecylamine, and a mixture containing triethylenediamine, trimethylaminoethylpiperazine, and bis-2-dimethylaminoethyl ether. Naka col. 6, ll. 27-30, and col. 8, ll. 35-38.

Appellants acknowledge in the Specification it was known in the prior art that

[t]he reaction for forming a rigid polyurethane foam consists mainly of a urethane bond-forming reaction (gelling reaction) by a reaction of a polyol with an isocyanate, and a urea group-

forming reaction (blowing reaction) by a reaction of an isocyanate with water. The reaction for forming a rigid polyisocyanurate foam comprises, in addition to the above two types of reactions, an isocyanurate ring-forming reaction (trimerization reaction) by trimerization of an isocyanate. A catalyst presents a substantial influence not only to the rates of such reactions but also to the thermal conductivity of the foam, the curing rate of the foam surface, the adhesive strength, the moldability, the dimensional stability and the physical properties.

Spec. 3:5-18.

“[D]ichloromonofluoroethanes (HCFC analogues) . . . used to be employed as blowing agents in the production of rigid polyurethane foam,” and “as substitute blowing agents, [but] in recent years, it has been proposed to use 1,1,1,3,3-pentafluoropropane (HFC-245fa), or 1,1,1,3,3-pentafluorobutane (HFC-365mfc) as a hydrofluorocarbons (HFC) . . . or a hydrocarbon.” Spec. 3:25 to 4:7.

Appellants further acknowledge it was known to use catalysts which accelerate the gelling reaction and/or the blowing reaction in the production of rigid polyurethane foams:

Heretofore, an organic metal catalyst or a tertiary amine catalyst has been used, and particularly, it is already widely known that a tertiary amine catalyst will be a catalyst excellent for the production for polyurethane foam. Among such tertiary amine catalysts, those industrially used as catalysts for production of polyurethanes, may, for example, be compounds such as, triethylenediamine, N,N,N',N'-tetramethyl-1,6-hexanediamine, N,N-dimethylcyclohexylamine . . . .

Spec. 4:16 to 5:8. With respect to rigid isocyanurate foams, Appellants further acknowledge that

[a]s a catalyst for the production of a polyisocyanurate foam, it is already known to use in combination a catalyst to accelerate

the reaction of a polyisocyanate with a polyol (gelling reaction) and/or a catalyst to accelerate the reaction of a polyisocyanate with water (blowing reaction), and a catalyst to accelerate the polyisocyanurate reaction (trimerization of a polyisocyanate).

Spec. 8:7-14. Appellants acknowledge that catalysts used in the prior art to accelerate the trimerization reaction include, among other things, organic metal catalysts, metal carboxylate catalysts, tertiary amine catalysts, and quaternary ammonium salts. Spec. 5:9 to 8:6 and 8:15-27.

Considering first the grounds of rejection under § 103(a), we determine the combined teachings of Lancaster and Naka and of Canaday and Naka, the scope of which we determined above, provide sufficient evidence supporting the Examiner's case that the claimed invention encompassed by claims 1, 29 through 31, 37, and 38, as we interpreted these claims above, would have been prima facie obviousness to one of ordinary skill in the molding arts familiar with processes of preparing rigid polyurethane and polyisocyanurate foams.

As the Examiner points out, one of ordinary skill in this art, armed with the knowledge in the art, following the combined teachings of each set of references would have used mixtures of tertiary amines from those taught in Lancaster and in Canaday along with Naka, thus arriving at mixtures which fall within the claimed mixtures of amines (1) and (2) specified in claims 1, 29 through 31, 37, and 38. Ans. 4-7 and 8-9. Lancaster discloses dimethylethyamine and Canaday discloses dimethylbutylamine which fall within claimed amines (1). With respect to claimed amines (2), both references disclose triethylenediamine and Canaday further discloses N,N,N',N'-tetramethyl-1,6-hexanediamine and N,N-dimethylcyclohexylamine, all three known to be similarly useful in

preparing rigid polyurethane foams as disclosed by Naka and acknowledged by Appellants. Lancaster and Canaday further disclose that triethylenediamine can be used in preparing rigid polyisocyanurate foams. Indeed, Appellants acknowledge that it was known in the art to use a mixture of catalysts for the various reactions known to occur in the preparation of rigid polyurethane and polyisocyanurate foams. In these respects, all three references teach using the same and similar tertiary amine catalysts in appropriate amounts in mixtures, which can include additional same and similar catalyst(s), that are useful to prepare the same and similar rigid polyurethane and polyisocyanurate foams with compositions containing the same and similar polyol(s), isocyanate(s), blowing agent(s), foam stabilizer(s), and other ingredients, thus obtaining desired properties including dimensional stability. The fact that the references do not disclose a catalytic mixture containing the claimed amines (1) and (2) does not detract from these teachings of the references. *See, e.g., Merck v. Biocraft Labs.*, 874 F.2d 804, 807 (Fed. Cir. 1989) (quoting *In re Lamberti*, 545 F.2d 747, 750 (CCPA 1976) (“But in a section 103 inquiry, ‘the fact that a specific [embodiment] is taught to be preferred is not controlling, since all disclosures of the prior art, including unpreferred embodiments, must be considered.’”).

We further agree with the Examiner that the determination of the optimum and workable ranges of amounts of catalysts to use in admixture in these compositions to provide rigid polyurethane and polyisocyanurate foams with desired properties can be reasonably determined by routine experimentation by one of ordinary skill in the art following the teachings of

the reference. Ans. 4-5 and 6-7. *See, e.g., In re Boesch*, 617 F.2d 272, 276 (CCPA 1980) (“[D]iscovery of an optimum value of a result effective variable in a known process is ordinarily within the skill of the art.”); *In re Aller*, 220 F.2d 454, 456 (CCPA 1955)(“[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.”).

Accordingly, we are of the opinion that one of ordinary skill in this art, armed with the knowledge in the art, routinely following the combined teachings of Lancaster and Naka and of Canaday and Naka would have reasonably arrived at the claimed catalyst mixtures encompassed by claims 1, 29 through 31, 37, and 38 without recourse to Appellants’ Specification. *See, e.g., KSR Int’l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1739 (2007) (“The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results.”); *In re Kahn*, 441 F.3d 977, 985-88 (Fed. Cir. 2006); *Merck*, 874 F.2d at 807 (“That the ‘813 patent discloses a multitude of effective combinations does not render any particular formulation less obvious. This is especially true because the claimed composition is used for the identical purpose taught by the prior art.”); *In re Corkill*, 771 F.2d 1496, 1497-1500 (Fed. Cir. 1985); *see also In re O’Farrell*, 853 F.2d 894, 903-04 (Fed. Cir. 1988) (“For obviousness under § 103, all that is required is a reasonable expectation of success.” (citations omitted)).

Upon reconsideration of the record as a whole in light of Appellants’ contentions, we are of the opinion that Appellants have not successfully shown that the combined teachings of Lancaster, alone or in view of Naka,

and of Canaday, alone, or in view of Naka would not have disclosed to one of ordinary skill in this art a catalyst mixture as claimed. Appellants contend that while both Lancaster and Canaday discloses the use of catalyst mixtures, neither discloses any advantage in doing so. App. Br. 15 and 19. In this same respect, Appellants further contend Naka does not show the equivalence of the claimed group (2) amines or that the same are used in mixtures, and does not recognize any advantage in using mixtures of catalysts. App. Br. 16. Appellants contend the claimed catalyst compositions result in an improvement in the property of at least dimensional stability compared to the use of either amine (1) or amine (2) alone. App. Br. 16. Appellants further contend that the references do not disclose using amine catalysts with the blowing agents specified in the claims. Reply Br. 2.

The difficulty we have with Appellants' contentions is that Lancaster and Canaday illustrate the processes of making the rigid polyurethane and polyisocyanurate foams disclosed therein with processes using mixtures of catalysts, and Appellants acknowledge that mixtures of catalysts are known to be used in such processes. Furthermore, we interpreted independent claims 1, 37, and 38 above to specify that the amount of amines (1) and (2) in the catalyst mixture must improve to any extent the dimensional stability property or a balance of properties including this property, of any one rigid foam produced "by means of" at least one specified blowing agent when compared to a foam produced by a process using any amount of amines (1) or (2) alone but is otherwise the same. In this respect, there is no limitation in these claims requiring that the use of the claimed mixtures must result in

an improvement in dimensional stability in every rigid polyurethane and polyisocyanurate foam produced by a process in which a claimed mixture of amines (1) and (2) alone or with other catalyst(s) in amounts meeting the last clause of these claims is used. This includes processes where the foams are prepared with any amount of at least one of the specified blowing agents alone or with other blowing agents. Indeed, the recitation of a particular property in a composition claim does not necessarily change the scope of the claim, and we determine the mere recitation of the property of dimensional stability for the purpose of determining the amounts of amines (1) and (2) in any composition does not do so here. *See e.g., Corkill*, 771 F.2d at 1499 (*citing In re Wright*, 429 F.2d 477, 450 (CCPA 1970)). Thus, we remain of the opinion that, prima facie, one of ordinary skill in this art routinely following the combined teachings of the references as applied would have reasonably selected mixtures of catalysts and amounts thereof falling with claims 1, 37, and 38, as we interpreted these claims above, to obtain rigid polyurethane and polyisocyanurate foams having the desired degree of dimensional stability, which property is taught to be desirable by each of the references.

Appellants principally contend the claimed catalyst mixtures produce “a polyurethane foam that is superior to one using either amine compound alone as a catalyst when used in conjunction with a blowing agent” specified in the independent claims as established by comparative data in the Specification. App. Br. 6 and Evidence Appendix, citing Spec. 53:17 to 82:5; Reply Br. 2. In this respect, Appellants rely in part on the processes illustrated in Examples 1-24 and Comparative Examples 1-29, with the



reactants, reagents, catalysts, and products described in Tables 1-6 and explained at Specification pages 68-69. App. Br. 6-7.

We find Examples 1-24 are directed to processes using the specified parts by weight of a sucrose/aromatic amine type polyether polyol, either blowing agent 1,1,1,3,3-pentafluoropropane (HFC-245fa) in Examples 1-12 or 1,1,1,3,3-pentafluorobutane (HFC-365mfc) in Examples 12-24, the blowing agent water and a silicone type surfactant as a foam stabilizer, blended together as Premix A. Premix A is mixed with the specified parts by weight of *mixtures* of one of the amines (1) dimethylbutylamine, dimethylhexylamine, dimethyloctylamine, and dimethyldodecylamine, and one of the amines (2) triethylenediamine, N,N,N',N'-tetramethyl-1,6-hexanediamine and N,N-dimethylcyclohexylamine, in amounts determined “such that the reactivity as represented by . . . gel time would be 90 seconds.” An amount of a “crude MDI (MR-200)” isocyanate is then added “in such an amount that the isocyanate index . . . would be 110.” Spec. 54-55 and 63, and Table 1. The reported physical properties of the foams include flowability, adhesive strength, and dimensional stability. Spec. 55 and 63, and Table 2.

We find Comparative Examples 1-14 are directed to processes using the same amounts of the same ingredients in Premix A with blowing agent HFC-245fa in Comparative Examples 1-7 and blowing agent HFC-365mfc in Comparative Examples 8-14 as in Examples 1-24. Premix A is mixed with the specified parts by weight of *one* of amines (1) and (2) in Comparative Examples 1-7 and Comparative Examples 8-14 based on the same reactivity/time consideration as in Examples 1-24, and then with the same amount of isocyanate on the same basis as in those Examples. Spec.

60 and 63-64, and Table 3. The reported physical properties of the foams include flowability, adhesive strength, and dimensional stability. Spec. 60 and 64, and Table 4.

We find Comparative Examples 15-29 are directed to processes using in Premix A the same amounts of the same polyol, the blowing agent water, and foam stabilizer as in the other Examples and Comparative Examples but with blowing agent HCFC-141b, which is the chlorofluorocarbon 1,1-dichloro-1-fluoroethane, used at 25 parts by weight instead of 30 parts by weight for blowing agents HFC-245fa and HFC-365mfc in the other Examples and Comparative Examples. In Comparative Examples 15-26, Premix A is mixed with the specified parts by weight of *mixtures* of amines (1) and (2) as used in Examples 1-24, with the amounts determined based on the same reactivity/time consideration as in those Examples. In Comparative Examples 27-29, Premix A is mixed with the specified parts by weight of *one* of amines (2) based on the same reactivity/time consideration as in Examples 1-24. The same amount of isocyanate is used on the same basis as in those Examples. Spec. 64-65 and Table 5. The reported physical properties of the foams include flowability, adhesive strength, and dimensional stability. Spec. 65 and Table 6.

Appellants disclose the following conclusions. The foams produced by the claimed mixtures of amine compounds in Examples 1-24 produce foams “excellent” in flowability, adhesive strength, and dimensional stability. Spec. 68. The foams produced in Comparative Examples 1-4 and 8-11 using only amines (1) required “large amounts of catalyst” and were “inferior” in flowability and dimensional stability. Spec. 68. The foams

produced by Comparative Examples 5-7 and 12-14 using only amines (2) were “inferior” in flowability, adhesive strength, and dimensional stability. Spec. 68-69. The foams produced in Comparative Examples “15 to 21 [sic, 29]” with the blowing agent HCFC-141b “whereby even if the catalyst of the present invention was used, no remarkable effect was observed in the flowability, adhesive strength and dimensional stability.” Spec. 69.

We find the following results are reported in the Specification. The foams of Examples 1 to 12 (HFC-245fa and water blowing agents; amines (1) and (2)) exhibit flowability in the range of 79 to 83 cm; adhesive strength in the range of 1.14 to 1.45 kgf/cm<sup>2</sup>; and dimensional stability in the range of -0.7 to -1.5%. Spec. Table 2.

The foams of Examples 13 to 24 (HFC-365 mfc and water blowing agents; amines (1) and (2)) exhibit flowability in the range of 78 to 81 cm; adhesive strength in the range of 1.25 to 1.66 kgf/cm<sup>2</sup>; and dimensional stability in the range of -0.7 to -1.4%. Spec. Table 2.

The foams of Comparative Examples 1-4 and 8-11 (HFC-245fa or HFC-365 mfc and water blowing agents; amine (1)) exhibit flowability in the range of 75 to 77 cm; adhesive strength in the range of 1.38 to 1.75 kgf/cm<sup>2</sup>; and dimensional stability in the range of -7.2 to -9.2%. Spec. Table 4.

The foams of Comparative Examples 5-7 and 12-14 (HFC-245fa or HFC-365 mfc and water blowing agents; amine (2)) exhibit flowability in the range of 72 to 76 cm; adhesive strength in the range of 0.45 to 0.72 kgf/cm<sup>2</sup>; and dimensional stability in the range of -2.7 to -5.6%. Spec. Table 4.

The foams of Comparative Examples 15-26 (HCFC 141b blowing agent; amines (1) and (2)) exhibit flowability in the range of 80 to 84 cm; adhesive strength in the range of 1.62 to 1.86 kgf/cm<sup>2</sup>; and dimensional stability in the range of -0.8 to -1.5%. Spec. Table 6.

The foams of Comparative Examples 27 to 29 (HCFC 141b and water blowing agents; amine (2)) exhibit flowability in the range of 81 to 84 cm; adhesive strength in the range of 1.62 to 1.86 kgf/cm<sup>2</sup>; and dimensional stability in the range of -0.9 to -1.3%. Spec. Table 6.

Appellants group the data reported for Examples 1-24 and Comparative Examples 1-14 based on each of catalysts HFC-245fa and HFC-365 mfc and the claimed mixtures and amines (1) and (2) alone, contending the data shows “adhesive strength and dimensional stability can be improved” by using the claimed mixture of amine catalysts and the specified blowing agents HFC-245fa and HFC-36 5 compared to using any of the amine catalysts alone with these blowing agents. App. Br. 7-12. Appellants further state “Comparative Examples 15-26, using the amine combination of the present claims but with a different blowing agent[, that is, HCFC 141b,] caused little change in flowability, adhesive strength or dimensional stability of the foams.” App. Br. 7.

Appellants further rely on a comparative data “analogous” to the above that “highlights the significance of using a low boiling point hydrocarbon, such as cyclopentane alone or as combined with isopentane, as an applicable blowing agent,” set forth in Examples 25-48 and Comparative Examples 30-58, as explained at Specification pages 81-82.

We find the processes of preparing rigid polyurethane foam in Examples 25-36 using cyclopentane and water and water blowing agents, and in Examples 37-48 using cyclopentane, isopentane, and water blowing agents, differ in that the amount of cyclopentane employed is less when combined with isopentane. Spec. 69-70 and Table 7. In addition to these differences, the Examples 25-48 further differ from the processes of Examples 1-24 in that two different polyols are used in Premix A, a “waste PET type polyester polyol” and a “Mannich type polyester polyol” with different OH values. Spec. Tables 1 and 7. The specified parts by weight of *mixtures* of amines (1) and (2) used in Examples 25-48 are determined based on the reactivity/time considerations. Spec. 69. We find the processes of Comparative Examples 30-36 (cyclopentane and water blowing agents; amine (1) or amine (2)) and Comparative Examples 37-43 (cyclopentane, isopentane and water blowing agents; amine (1) or amine (2)) are similar except for the amounts of the blowing agents and catalysts. Spec. 75 and Table 9. The processes of Comparative Examples 45-58 use HCFC 141b and water blowing agents, and amines (1) and (2) or amine (2) as catalysts with the other ingredients of Examples 25-48, thus differing from the processes of Comparative Examples 15-29. Spec. 78 and Tables 1 and 11. The reported physical properties of the foams include flowability, adhesive strength, and dimensional stability. Spec. Tables 8, 10, and 12.

Appellants disclose the following conclusions. The foams produced by the claimed mixtures of amine compounds in Examples 25-48 are “excellent” in flowability, adhesive strength, and dimensional stability. Spec. 81. The foams produced in Comparative Examples 30-33 and 37-40

using only amines (1) required “large amounts of catalyst” and were “inferior” in flowability and dimensional stability. Spec. 81. The foams produced by Comparative Examples 34-36 and 41-43 using only amines (2) were “inferior” in flowability, adhesive strength, and dimensional stability. Spec. 81. The foams produced in Comparative Examples 44-58 with blowing agent HCFC-141b “whereby even if the catalyst of the present invention was used, no distinct effect to the flowability, adhesive strength and dimensional stability was observed.” Spec. 81-82.

We find the following results are reported in the Specification. The foams of Examples 25-36 (cyclopentane and water blowing agents; amines (1) and (2)) exhibit flowability in the range of 76 to 80 cm; adhesive strength in the range of 1.6 to 2.03 kgf/cm<sup>2</sup>; and dimensional stability in the range of -0.7 to -1.4%. Spec. Table 8.

The foams of Examples 37-48 (cyclopentane, isopentane, and water blowing agents; amines (1) and (2)) exhibit flowability in the range of 77 to 81 cm; adhesive strength in the range of 1.55 to 1.8 kgf/cm<sup>2</sup>; and dimensional stability in the range of -0.5 to -1.1%. Spec. Table 8.

The foams of Comparative Examples 30-33 and 37-40 (cyclopentane alone and with isopentane, and water blowing agents; amine (1)) exhibit flowability in the range of 72 to 75 cm; adhesive strength in the range of 1.74 to 2.03 kgf/cm<sup>2</sup>; and dimensional stability in the range of -6.0 to -8.1%. Spec. Table 10.

The foams of Comparative Examples 37-43 (cyclopentane alone and with isopentane, and water blowing agents; amine (2)) exhibit flowability in the range of 70 to 74 cm; adhesive strength in the range of 0.88 to 1.02

kgf/cm<sup>2</sup>; and dimensional stability in the range of -2.8 to -5.0. Spec. Table 10.

The foams of Comparative Examples 44-55 (HCFC 141b and water blowing agents; amines (1) and (2)) exhibit flowability in the range of 77 to 81 cm; adhesive strength in the range of 1.64 to 1.88 kgf/cm<sup>2</sup>; and dimensional stability in the range of -0.1 to -1.5%. Spec. Table 12.

The foams of Comparative Examples 56-58 (HCFC 141b and water blowing agents; amine (2)) exhibit flowability in the range of 78 to 81 cm; adhesive strength in the range of 1.64 to 1.8 kgf/cm<sup>2</sup>; and dimensional stability in the range of -1.0 to -1.4%. Spec. Table 12.

Appellants group the data reported for Examples 25-48 and Comparative Examples 30-43 based on the catalyst cyclopentane and the mixture of catalysts cyclopentane and isopentane and the claimed mixtures and amines (1) and (2) alone, contending the data shows that processes using a low boiling point solvent and an amine (1) or (2) alone produce a rigid polyurethane foam in which “the dimensional stability was reduced substantially.” App. Br. 14.

With respect to the comparisons in the Specification as a whole, Appellants contend that, as described at Specification page 9,

blowing agents of the type recited in the present claims are hardly soluble in a polyol as compared to dichloromonofluoroethane (HCFC) analogs, are expensive, and if various tertiary amine catalysts are used, the amount of water to be used will be substantial, whereby there will be a problem that, compared to rigid polyurethane foams obtained using conventional HCFC or the like as a blowing agent, the foam will be inferior in flowability, adhesive strength and dimensional stability. Thus, the presently-claimed invention is

particularly efficacious when used to make rigid polyurethane foams using at least one of the blowing agents recited in the present claims.

App. Br. 14-15.

The Examiner finds the comparative data unconvincing of unexpected results for the claimed catalyst mixture for the reasons that comparisons are not made with the closest prior art which teaches mixtures of catalysts, and the results are not demonstrated to be unexpected compared with the prior art mixtures and not mere optimization. Ans. 10-11. The Examiner further finds the comparative data is not commensurate with the scope of the claims. Ans. 10-11.

Appellants contend the comparative data reflects the prior art which discloses that the catalysts can be used individually, and argues the comparative data is probative since it directed to blowing agents specified in the claims which are not disclosed in the prior art. App. Br. 16-17; Reply Br. 2. Appellants further contend the comparative data is commensurate in scope with the claims which require the amounts of amines (1) and (2) in the catalyst mixture to result in an improvement in at least the property of dimensional stability over the use of amines (1) or (2) alone. App. Br. 17. Appellants rely on the comparative data with respect to claims 1, 29 through 31, 37, and 38. App. Br. 18 and 20-21.

We first consider Appellants' characterization of the range of reported results in the properties of flowability, adhesiveness, and dimensional stability of the rigid polyurethane foams prepared in the Examples with fluorocarbon blowing agents, low blowing point hydrocarbons, and mixtures of catalysts, as "excellent," and the characterization of the same range of



reported results in the same properties in rigid polyurethane foams prepared in Comparative Examples with the chlorofluorocarbon blowing agent and mixtures of the same catalysts and with amines (2) only as “no remarkable effect” and “no distinct effect.” To the contrary, we find little difference because the ranges of reported results in these properties for the foams in these Example and Comparative Examples are substantially the same. *See above* pp. 17-18 and 20-22. Similarly, we find Appellants characterization of the reported ranges of results in the property of flowability of foams prepared in Comparative Examples with fluorocarbon blowing agents, low blowing point hydrocarbons, and single catalysts as “inferior” does not, on this record, reasonably appear to be a fair evaluation when the upper end of these ranges overlap with or are close to the lower end of the ranges of reported results for the same property of the foams of the Examples characterized as “excellent.” *See above* pp. 17-18 and 20-22. Appellants further characterize the amounts of the amine (1) catalyst used to prepare foams with the fluorocarbon HFC-245fa blowing agent as “large amounts” without explanation even though the amounts of catalyst were determined “such that the reactivity as represented by . . . gel time would be 90 seconds” in the same manner as the mixture of catalysts in the Examples and in the Comparative Examples based on the chlorofluorocarbon blow agent and amine (2). *Se, e.g., In re Lindner*, 457 F.2d 506, 508 (CCPA 1972) (“mere conclusory statements in the specification . . . are entitled to little weight when the Patent Office questions the efficacy of those statements.” (citations omitted)).

We find that in the Examples and in the Comparative Examples employing the chlorofluorocarbon blowing agent, the amines (1) and (2) are used in the catalytic mixtures in amounts which fall within claims 1, 29 through 31, 37, and 38 as we have interpreted these claims above.

On this record, we find that the reported results for the rigid polyurethane foams prepared with a fluorocarbon and low boiling point hydrocarbon blowing agents and a mixture of amines (1) and (2) according to the Examples, and for such foams prepared with the same blowing agents and a single amine (1) or (2) in the Comparative Examples show that the foams prepared with the mixture have better dimensional stability properties than the foams prepared with a single amine and have better adhesive properties than the foams prepared with a single amine (2).

On the other hand, we find that the reported results for the rigid polyurethane foams prepared with a chlorofluorocarbon and a mixture of amines (1) and (2) according to Comparative Examples and for such foams prepared with the same blowing agent and a single amine (2) in the Comparative Examples show that the foams prepared with mixtures and with single amines (2) have substantially the same ranges of results in the three properties.

Furthermore, we agree with the Examiner that the record does not contain evidence or argument establishing the practical significance of the results to one of ordinary skill in this art, and that this person would have found the results unexpected in light of the combined teachings of Lancaster and Naka and of Canaday and Naka. Indeed, this person would have been armed with the knowledge in the art that mixtures of amines are useful in

preparing rigid polyurethane foams, and would have been led by the combinations of references to use mixtures of the amines disclosed therein. *See, e.g., Pfizer, Inc. v. Apotex, Inc.*, 480 F.3d 1348, 1371 (Fed. Cir. 2007) (“[B]y definition, any superior property must be *unexpected* to be considered as evidence of non-obviousness.” (citations omitted)); *In re Geisler*, 116 F.3d 1465, 1470 (Fed. Cir. 1997); *In re Merck*, 800 F.2d 1091, 1099 (Fed. Cir. 1986); *In re Longi*, 759 F.2d 887, 897 (Fed. Cir. 1985); *Lindner*, 457 F.2d at 508; *In re Klosak*, 455 F.2d 1077, 1080 (CCPA 1972); *In re D’Ancicco*, 439 F.2d 1244, 1248 (CCPA 1971).

The differences in properties between the foams of the Examples and the foams of the Comparative Examples prepared with amines (1) or (2) compared to the little difference in properties between the foams of the Comparative Examples prepared with the chlorofluorocarbon blowing agent and the claimed mixtures and with amine (2) alone must be accounted for. Furthermore, the tested properties, especially dimensional stability, are known in the art as important properties, as Appellants acknowledge and as recognized in the applied references, thus leading one of ordinary skill in the art to optimize the reactants, reagents, and reaction parameters to obtain foams which exhibit these properties to a desirable extent as taught in the references.

There is also no evidence or explanation on the record establishing the practical significance of a process limitation to determine the amounts of the catalysts employed. Indeed, Appellants characterize the amounts of single amines (1) as “large” without explanation. In this respect, in the absence of an explanation, the little difference in the properties of the foams prepared in

the Comparative Examples with the chlorofluorocarbon blowing agent using mixtures and single amines (2) suggests that amounts of single amines (1) and of single amines (2) can result in better properties. Moreover, we find little difference in the reported results in the three properties between the rigid polyurethane foams prepared with fluorocarbon and low boiling point hydrocarbon blowing agents and with the chlorofluorocarbon blowing agent.

Thus, Appellants' contention that the evidence establishes the claimed mixtures are more efficacious with fluorocarbon and low boiling point hydrocarbon blowing agents than with chlorofluorocarbon blowing agents requires explanation as well.

In the absence of evidence or explanation establishing the practical significance of the comparative evidence vis-à-vis the applied prior art, we further agree with the Examiner that the comparisons do not reflect the closest prior art. As the Examiner points out, the applied prior art teach and illustrate the disclosed processes with mixtures of catalysts. We also do not find a comparison based on the catalytic tertiary amine dimethylethylamine which is specifically disclosed by Lancaster. We further note that both Lancaster and Canaday teach the use of additional reagents which result in dimensionally stable foams, which reagents are not used in the compared processes. *See, e.g., In re Baxter Travenol Labs.*, 952 F.2d 388, 392 (Fed. Cir. 1991) (“[W]hen unexpected results are used as evidence of nonobviousness, the results must be shown to be unexpected compared with the closest prior art.” (citation omitted)); *In re Burckel*, 592 F.2d 1175, 1179-80 (CCPA 1979) (the claimed subject matter must be compared with the closest prior art in a manner which addresses the thrust of the rejection);

*In re Dunn*, 349 F.2d 433, 439 (CCPA 1965) (“[W]e do not feel it an unreasonable burden on appellants to require comparative examples relied on for non-obviousness to be truly comparative. The cause and effect sought to be proven is lost here in the welter of unfixed variables.”).

Finally, even if it is held that the evidence establishes unexpected results with the claimed catalyst mixtures in the compared processes, the evidence presented does not provide assurance that the same result would be exhibited in the myriads of processes based on the same or similar reactants and reagents and amounts thereof, such as those disclosed in Lancaster, Canaday, and Naka combined as applied, in which the catalytic mixtures encompassed by claims 1, 29 through 31, 37, and 38, as we interpreted these claims above, can be used. *See, e.g., In re Kulling*, 897 F.2d 1147, 1149-50 (Fed. Cir. 1990); *In re Clemens*, 622 F.2d 1029, 1035-36 (CCPA 1980); *In re Greenfield*, 571 F.2d 1185, 1189 (CCPA 1978); *Lindner*, 457 F.2d at 508.

On this record, we are not persuaded that the comparative data in the Specification as a whole relied on by Appellants overcomes the strong showing of prima facie obviousness. *See, e.g., Pfizer*, 480 F.3d at 1372 (“Although secondary considerations must be taken into account, they do not necessarily control the obviousness conclusion.” (citation omitted.)).

Accordingly, based on our consideration of the totality of the record before us, we have weighed the evidence of obviousness found in the combined teachings of Lancaster and Naka and of Canaday and Naka with Appellants’ countervailing evidence of and argument for nonobviousness and conclude that the claimed invention encompassed by appealed claims 1,

29 through 33, 37, and 38 would have been obvious as a matter of law under 35 U.S.C. § 103(a).

Turning now to the ground of rejection under § 112, first paragraph, written description requirement, the Examiner establishes a prima facie case of noncompliance with this statutory provision, by setting forth evidence or reasons why, as a matter of fact, the written description in the Specification as filed as a whole would not reasonably convey to persons skilled in this art that Appellants were in possession of the invention defined by the appealed claims, including all of the limitations thereof, at the time the Application was filed. *See, e.g., In re Alton*, 76 F.3d 1168, 1172, 1175-76 (Fed. Cir. 1996) (citing *In re Wertheim*, 541 F.2d 257, 262-64 (CCPA 1976)). If the Examiner establishes a prima facie case of noncompliance with this statutory provision, the burden shifts to Appellants to establish otherwise with argument and/or evidence. When Appellants submit argument and/or evidence in rebuttal, the burden shifts back to the Examiner to again establish a prima facie case based on the totality of the record including such arguments and evidence. *Alton*, 76 F.3d at 1175-76. A limitation which is not mentioned in the specification can be later inserted into a claim if “one skilled in the art would recognize upon reading the specification that the new language reflects what the specification shows to have been invented.” *All Dental Prodx LLC v. Advantage Dental Products Inc.*, 309 F.3d 774, 778 (Fed. Cir. 2002).

We interpreted the last clause of independent claims 1 and 37 above to require that the amounts of the amines (1) and (2) present in the catalyst mixture must be effective to improve to any extent at least the property of

dimensional stability of any one rigid polyurethane foam when using a specified blowing agent. *See above* pp. 4 and 6. We further interpreted the last clause of independent claim 38 to require a net improvement in one of the properties of flowability, adhesive strength and dimensional stability. *See above* p. 6. On this record, we are of the opinion Appellants have shown that the claimed invention was disclosed to one skilled in the art in the Specification at the time it was filed. Reply Br. 3, citing Spec. 12:5-12.

Thus, Appellants' argument has overcome the Examiner's initial prima facie case, and the Examiner has not again established a prima facie case on the record. Accordingly, we reverse this ground of rejection.

The Primary Examiner's decision is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED

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